UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
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APR 20 1993

Ref: 8HWM-FF

Mr. Gary Baughman
Colorado Department of Health
4300 Cherry Creek Drive South
Denver, CO 80222-1530

RE; TM #4 - Human Health Risk Assessment (HHRA)
for OU 4, the Solar Ponds

Dear Mr. Baughman:

Attached please find EPA's comments on Technical Memorandum (TM) #4. It is EPA's position that this document in its current form is inadequate to meet the HHRA objectives for OU 4, the Solar Ponds. The document will need to undergo extensive revisions. Therefore, EPA recommends withholding approval of this document to ensure that DOE makes the appropriate revisions. We expect DOE to incorporate adequate responses to our comments in the revised version.

Please do not hesitate to contact Arturo Duran of my staff at (303) 294-1080 with any questions you may have or to set up a meeting to discuss this matter further.

Sincerely,

Martin Hestmark, Manager
Rocky Flats Program

Enclosure
cc: Richard Schassburger, DOE
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1.0 GENERAL COMMENTS

1. The purpose of this technical memorandum is to identify and describe potential and reasonable maximum exposure (RME) scenarios for present and future human receptors in OU4 and to present reasonable maximum intake parameters which will be used to estimate chemical intake. Although the memorandum comprehensively identifies exposure scenarios, the intake parameters presented in many of the scenarios fall short of reasonable maximum values conventionally used for Superfund sites. The parameters should be revised to reflect a more conservative approach which will provide consistency with other Superfund sites. Otherwise, human health risks could be underestimated.

2. The document asserts that future development of off-site land will be mainly industrial. This assertion is unsubstantiated, misleading, and conflicts with tables and figures presented in Section 3.0 which indicate a nearly three-fold increase in residential population by the year 2010 in the area surrounding RFP. Residential development around RFP is currently unrestricted, and master plans predict that such development is likely in the future. A future off-site residential scenario should be included for evaluation because this information is essential for risk managers who will ultimately evaluate all remedial options.

2.0 SPECIFIC COMMENTS

1. Page 3-12 through Page 3-14, Section 3.5.1. The text details the health and safety programs in place at RFP to protect workers from exposure to chemical, physical, and biological hazards. However, this text is inappropriate for a risk assessment. The site has yet to be characterized and hazards have not been identified for OU4. Moreover, chemical concentrations and exposures cannot be determined at this time. This information is vital to enforcing regulations established by the Occupational Safety and Health Administration. Without this information workers cannot monitor or limit their exposures. Thus, occupational health hazards from exposure to contaminants will not become known until the risk assessment for OU4 is completed.

   Rationale: Health and safety plans are not relevant in a risk assessment.

2. Page 4-3, Last Paragraph. The text states "Dermal contact with soil will be assessed quantitatively only if results of OU4 Phase I sampling programs demonstrate the presence of organic chemicals of concern in surface soil samples at concentrations exceeding background levels." This approach is inappropriate for three reasons (EPA, 1989a). First, all chemicals of concern (COCs) should be evaluated for every appropriate pathway. Second, unlike inorganic chemicals which naturally occur, all organic chemicals are considered by EPA to be of anthropogenic origin. Thus, there are no background concentrations which organic compounds can be compared to. Third, if organic chemicals are detected in background samples, the background area selection will be invalidated because it indicates the area was affected by RFP activities. Dermal contact should be considered in the quantitative analysis.

   Rationale: All COCs should be evaluated for all exposure pathways. Organic chemicals should be considered anthropogenic and cannot be eliminated based on comparison to background samples.

3. Page 4-4, Second Paragraph. The text prematurely compares soil and airborne volatile organic compound (VOC) concentrations with preliminary remediation goals (PRGs) and other risk-based concentrations. This type of analysis is conventionally carried out in a subsequent feasibility study (FS). It is also inappropriate to compare exposure concentrations with Occupational Safety and Health Administration (OSHA) or American Conference of Government Industrial Hygienists (ACGIH) standards for the protection of workers. Risk assessments evaluate risks from contaminants at a site. Risk Assessment Guidance for Superfund (RAGS) (EPA 1989a) explicitly describes the methodology to eliminate contaminants from the list of chemicals of potential concern (COPCs). These procedures should be followed, since the RFP is a National Priority List (NPL) site.

   Rationale: The comparison of VOCs to worker protection standards and risk-based concentrations is inappropriate for a risk assessment.

4. Page 4-4, Fourth Paragraph. The text states that "inhalation of VOCs will only be assessed quantitatively in the risk assessment if the results of the OU4 Phase I sampling programs show that the VOC concentrations exceed the concentrations derived in Appendix C." The concentrations presented in Appendix C are PRGs and other health-based concentrations. As explained above, this comparison is inappropriate in a risk assessment and is an unacceptable method for determining COPCs. Consequently, this methodology should not be used. All VOCs in soil and air should be carried through a quantitative risk assessment until it can be verified that they pose no risk to human health. RAGS should be consulted (EPA, 1989a) for further guidance on eliminating chemicals from a risk assessment.

   Rationale: RAGS guidance should be followed to identify COPCs in OU4.

5. Page 4-6, Section 4.5.1. This section states that inhalation of VOCs in indoor air will not be assessed for any receptor because this pathway is suspected to be incomplete. This suspicion can not be substantiated a priori. Contamination in the ground water at OU4, which has yet to be characterized, may contain VOCs. Receptors in future office buildings or residences built on the site could be affected by VOCs in ground water, as they migrate through crawl spaces or basements. Therefore, this pathway should be assessed in the risk assessment.

   Rationale: All potential exposure pathways should be addressed.

6. Page 4-8, Section 4.5.2.2. The text states that external radiation exposure from wind dispersed radionuclides will not be addressed quantitatively for current off-site residential receptors. Exposure to wind dispersed radionuclides includes exposure to external gamma radiation which is part of a comprehensive exposure pathway for off-site residential receptors and should be quantitatively assessed in the risk assessment.

   Rationale: All potential exposure pathways should be addressed.

7. Page 4-9, Second Paragraph. Surface deposition of particulates on vegetables is listed as the only contaminant exposure for homegrown vegetable ingestion. The text states plant uptake is expected to be insignificant due to the bioavailability of contaminants and reduced contaminant concentrations in off-site soils. Although this may be correct, including plant uptake of chemicals in the soil will complete this exposure pathway and should be included in the quantitative assessment of both fruit and vegetable ingestion for on- and off-site residential receptors (Baes et al., 1984).

Rationale: Complete exposure pathways should be assessed even if their contribution to overall risk is expected to be small.

8. Page 4-9, Third Paragraph. Ingestion of homegrown fruit is not considered an exposure pathway for current off-site residential receptors, but should be quantitatively assessed for a thorough analysis of possible human health risks (EPA, 1989a). RME estimates of homegrown fruit intake are available in Exposure Factors Handbook (EPA, 1989b).

Rationale: Ingestion of homegrown fruit should be addressed in the risk assessment.

9. Page 4-16, First Paragraph. Ingestion of homegrown fruit is not considered as an exposure pathway for hypothetical future on-site residents but should be quantified for a complete assessment of risk (EPA 1989a, 1986). RME estimates are available from the Exposure Factors Handbook (EPA, 1989b). Plant uptake of chemicals in the soil, as well as surface deposition of particulates, should be included in the assessment of fruit ingestion (Baes et al., 1984).

In addition, inhalation of VOC's from subsurface soils into basements should be considered as a pathway of exposure for future on-site residents. Elimination of this pathway from consideration at this time is premature.

Rationale: All potential exposure pathways should be addressed in the risk assessment.

10. Page 5-3, Section 5.1.1. Exposure assumptions for an ecological worker are listed as 5 days/week for a 16 week field season. The Rocky Mountain Arsenal has done extensive research on this area. They interviewed ecological workers at three wildlife/ecological preserves and gathered information on exposure time, exposure duration, soil ingestion rates, etc. This information is available in the September 1992 Integrated Endargement Assessment/Risk Characterization for the Rocky Mountain Arsenal. Attached to these comments is a summary sheet of the results which recommends an 8 hour/day, 242 days/year, 17 years/lifetime. EPA recommends that this information be used in the Rocky Flats exposure assessment.

Rationale: RME values and assumptions should be health-conservative.

11. page 5-4, First Indented Paragraph. Current and future onsite occupational receptors should be assume to breathe onsite air 8 hours/day, not 4 hours/day, unless they will be physically off-site for the remainder of the day.

Rationale: The RME value should be conservative, unless otherwise justified.

12. Page 5-4, Third Indented Paragraph. A deposition factor of 25 percent is proposed in the assumptions for inhalation exposure. If 75 percent (EPA, 1985) of inhaled particles do not deposit in the lung, they must either be swallowed or expectorated. Ingestion calculations should be adjusted to reflect swallowing of inhaled particulate matter if a deposition factor is used in the inhalation equation. Additionally, deposition factors depend on a number of variables, including aerodynamic particulate diameter and concentration of this fraction in ambient air. Data supporting the deposition factor used in the risk assessment should be provided.

Also, when EPA develops Reference Concentrations (RfC) for chemicals using pharmacokinetic data, deposition of particles in the lungs is part of the calculation. To include an additional deposition factor in the exposure assumption would be essentially double counting the effect. If DOE has chemical specific pharmacokinetic information which can be used to refine the estimate of toxicity, EPA suggests that this information be submitted to EPA's Reference Dose/Reference Concentration Workgroup. This information does not belong in the estimate of exposure.

Rationale: Use of a deposition factor should be supported by site-specific data. Intake from ingestion should be adjusted accordingly.

13. Page 5-5, Second Indented Paragraph. The text proposes using a "fraction ingested from contaminated source" factor to modify soil ingestion based on the amount of time spent outdoors and the size of OU4 relative to the total area of RFP. The use of this fraction is inappropriate and could underestimate soil intake. The soil ingestion input parameters from RAGS (EPA, 1989a) or the Exposure Factors Handbook (EPA, 1989b) include ingestion of indoor dust, which should be considered to have contaminant concentrations equal to outdoor soils. A factor for fraction ingested should not be used in determining chronic daily intake from soil.

Rationale: Fractions reducing exposure estimates from soil are inappropriate for RME assumptions.

14. Page 5-5, Third Indented Paragraph. The text indicates that a matrix effect, indicating bioavailability of chemicals in soil, will be used in determining soil intake. Bioavailability factors are chemical-specific and dependent on the particular soil-chemical matrix in which the chemical is ingested. These factors are widely variable for each chemical. Unless sufficient information can be provided to substantiate chemical-specific bioavailability, this factor should be eliminated from the soil intake equation.

Rationale: Bioavailability factors vary widely and contribute uncertainty to the intake equations.

15. Page 5-6, First Indented Paragraph. Using a 4-month harvesting season to reduce the intake of homegrown vegetables is inappropriate. The RME value for ingestion of vegetables is 80,000 milligrams per day (mg/day) (EPA, 1989b) based on a typical consumption of 200,000 mg/day and a proportion of 40 percent of vegetables being homegrown. The RME value should be used to determine contaminant intake through this pathway.

Rationale: RME values should be used to determine contaminant intake from homegrown vegetables.

16. Page 5-6, Third Indented Paragraph. The use of a matrix factor to account for bioavailability of contaminants deposited on the surface of homegrown produce is inappropriate. Particulates deposited on the surface of a plant are not covalently bound and should be assumed to be available for absorption in the gastrointestinal tract. Although it is possible that contaminants taken up by plants and incorporated into the structural plant parts may be less bioavailable than particulates on the surface of plants, very little information regarding this issue is available. Therefore, a reliable matrix factor cannot be estimated and should be eliminated from the intake equation, unless additional scientific information can be provided.

Rationale: The matrix factor is inappropriate for ingestion of contaminants from homegrown produce.

17. Page 5-6, Section 5.1.5. The value used to represent RME exposed body surface area is not consistent with the value typically used for residential receptors. Residential receptors are not likely to wear long sleeves and long pants when gardening, particularly in the summer, in their yards and therefore would have more body surface area exposed than indicated. This body surface area value should be increased for both on- and off-site residential receptors. EPA's Dermal Exposure Assessment: Principles and Applications (EPA, 1992) provides more acceptable body surface area estimates.

Rationale: The body surface area value presented is not an RME estimate for residential receptors.

18. Page 5-7, Second Indented Paragraph. The soil adherence factor listed is the midpoint of recommended values, but it is not the RME value. The RME value, as suggested by the Exposure Factors Handbook (EPA, 1989b) is 1.0 milligram per square centimeter (mg/cm^2).

Rationale: The proposed soil adherence factor is not an RME value.

19. Page 5-7, Third Indented Paragraph. The term "fraction exposed from contaminated medium" should be eliminated from this equation. This factor is being used in a manner similar to the fraction of soil ingested from a contaminated source (see specific comment 15) and is incorrect for similar reasons. It is incorrect to assume that exposure depends on the size of the area relative to the total size of the RFP buffer zone. Exposure should be dependent on the amount of time spent in the area, which in this case is 8 hours per day.

Rationale: Fractions reducing exposure estimates are inappropriate for RME assumptions.

20. Tables 5-1 through 5-21. The summary tables reflect inaccuracies noted in the text and should be corrected.

Rationale: The tables should be modified to incorporate changes made in the text.

21. Page 5-21, Table 5-11. The soil ingestion rate for the hypothetical future on-site ecological researcher underestimates potential exposure. An ingestion rate of 100 mg/day is the acceptable value for this receptor (EPA 1989a, 1989b).

Rationale: The soil ingestion rate presented for the ecological researcher is not conservative.

22. Appendices A, B, and C. Appendix A is a preliminary analysis of worker exposure to chemicals and radionuclides in the OU4 area. Appendix A is presented to "obtain a regulatory compliance perspective on current and potential future occupational risks." Appendices B and C present air monitoring data and PRGs for detected VOCs. These appendices should not be included in the risk assessment or this document. Occupational regulations and calculations of PRGs are irrelevant in a risk assessment. Occupational regulations are not considered in risk calculations and PRGs should not be calculated until risks are known. Typically, PRGs are presented in the feasibility study. These appendices should be removed.

Rationale: The appendices are inappropriate for a risk analysis.

3.0 REFERENCES

Baes, C.F.; Sharp, R.D.; Sjoreen, A.L.; and Shore, R.W., 1984. A Review of Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture. Oak Ridge National Laboratory. Prepared for U.S. Department of Energy, ORND-5786.

EPA, 1985. Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites. EPA/600/8-85/002. U.S. Environmental Protection Agency, Office of Health and Environmental Assessment, Washington, D.C.

EPA, 1986. Methods for Assessing Exposure to Chemical Substances: Volume 8, Methods for Assessing Environmental Pathways of Food Contamination. EPA/560/5-85-008. U.S. Environmental Protection Agency, Office of Toxic Substances, Washington, D.C.

EPA, 1989a. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part A). Interim final. EPA/540/1-89/002. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, D.C.

EPA, 1989b. Exposure Factors Handbook. EPA/600/8-89/043. U.S. Environmental Protection Agency, Office of Health and Environmental Assessment, Washington, D.C.

EPA 1992. Dermal Exposure Assessment: Principles and Applications. EPA/600/8-91/011B. U.S. Environmental Protection Agency, Office of Health and Environmental Assessment, Washington, D.C.

SUMMARY OF REVISED DISTRIBUTIONS FOR TDVs AND INTAKE PARAMETERS

Parameters	Population/ Subpopulation	Distribution	Mean	Std. Dev.	a	b	c	95th Percentile
TM (hours/day)	Refuge Worker	Fixed	—	—	—	—	—	8
	Biological/ Maintenance Worker	Fixed	—	—	—	—	—	8
DW (day/year)	Refuge Worker	Triangular	—	—	195	229	250	242
	Biological/ Maintenance Worker	Normal	225	10.23	—	—	—	242
TE (years/ lifetime)	Refuge Worker	Normal	6.82	6.14	—	—	—	16.92
	Biological/ Maintenance Worker	Normal	7.18	7.00	—	—	—	18.70
Soil Covering (mg/cm^2)	Refuge Worker	Lognormal	0.3176	0.1908	-1.301	0.5515	—	0.6744
	Biological/ Maintenance Worker	Lognormal	0.4075	0.2039	-1.010	0.4727	—	0.7929
Breathing Rate (m^3/hour)	Refuge Worker	Fixed	—	—	—	—	—	2.12
	Biological/ Maintenance Worker	Fixed	—	—	—	—	—	2.12
Dust Loading ($\mu g/m^3$)	Refuge Worker	Lognormal	40.35	34.26	3.426	0.7369	—	103.3
	Biological/ Maintenance Worker	Lognormal	56.21	32.88	3.882	0.5425	—	118.4
Soil Ingestion (mg/day)	Refuge Worker	Lognormal	25.27	23.78	2.912	0.7964	—	68.2
	Biological/ Maintenance Worker	Lognormal	32.17	31.74	3.131	0.8245	—	88.9

Biological/Maintenance Workers are Refuge Workers who spend at least 50 percent of their work time outdoors
Std. Dev. = Standard Deviation
Distributional Parameters

	a	b	c
lognormal	$\bar{y}$	S_y	NA
triangular	minimum	apex	maximum

$\bar{y}$ = mean of log transformed data
S_y = standard deviation of log transformed data

TM = exposure time
DW = exposure frequency
TE = exposure deviation